
The interactomes of POU5F1 and SOX2 enhancers in human embryonic stem cells.

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Public Summary:

This paper describes the 3D nuclear structure of human pluripotent stem cells. It reveals the features of chromosomal interaction and how it may regulate gene expression in pluripotent stem cells and in reprogramming

Scientific Abstract:

The genes POU5F1 and SOX2 are critical for pluripotency and reprogramming, yet the chromosomal organization around these genes remains poorly understood. We assayed long-range chromosomal interactions on putative enhancers of POU5F1 and SOX2 genes in human embryonic stem cells (hESCs) using 4C-Seq technique. We discovered that their frequent interacting regions mainly overlap with early DNA replication domains. The interactomes are associated with active histone marks and enriched with 5-hydroxymethylcytosine sites. In hESCs, genes within the interactomes have elevated expression. Additionally, some genes associated with the POU5F1 enhancer contribute to pluripotency. Binding sites for multiple DNA binding proteins, including ATF3, CTCF, GABPA, JUND, NANOG, RAD21 and YY1, are enriched in both interactomes. The RARG locus, frequently interacting with the POU5F1 locus, has abundant RAD21 binding sites co-localized with other protein binding sites. Thus the interactomes of these two pluripotency genes could be an important part of the regulatory network in hESCs.

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